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## U.S. DEPARTMENT OF COMMERCE National Oceanic and Atmospheric Administration National Marine Fisheries Service Southeast Fisheries Science Center Panama City Laboratory 3500 Delwood Beach Rd. Panama City, FL 32408

February 2011



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### Introduction

The history of the Florida-Georgia shark gillnet fishery in the US Atlantic, and observer coverage of that fishery, has been previously described (e.g. Carlson and Bethea 2007 and references therein, Passerotti and Carlson 2009). Currently, there are nearly 500 total directed and incidental shark permits issued to fishers in the US Atlantic and Gulf of Mexico, with the number of fishers using gillnet gear varying from year to year.

Since the implementation of Amendment 2 to the Consolidated Atlantic Highly
Migratory Species Fishery Management Plan (NMFS 2007), the directed large coastal shark
(LCS) gillnet fishery has been greatly reduced. The 33-head LCS trip limit has essentially ended
the strike net fishery and limited the number of fishers targeting LCS with drift gillnet gear. The
small coastal shark (SCS) fishery was also limited by Amendment 2, but was more directly
impacted by Amendment 3 to the Consolidated Atlantic Highly Migratory Species Fishery
Management Plan (NMFS 2010) which significantly reduced the SCS quota and established an
individual quota for blacknose sharks, *Carcharhinus acronotus*. As a result, many gillnet fishers
that historically targeted sharks are now targeting teleost species such as Spanish mackerel

Scomberomorous maculatus, king mackerel Scomberomorous cavalla, and bluefish Pomatomus
saltatrix, with varying types of gillnet gear. The southeast gillnet observer program currently
covers all anchored (sink and stab), strike, or drift gillnet fishing regardless of target by vessels
that fish from Florida to North Carolina and the Gulf of Mexico year-round.

Herein, we summarize fishing effort and catch and bycatch in these fisheries during January 2010 - December 2010, collectively referred to as '2010'.

### Methods

### Observer protocol

Vessels were selected on a quarterly basis (January, April, July, and September) randomly from a pool of vessels that had reported fishing with gillnet gear during the same quarter in the previous year. Selection letters notifying permit holders of required observer coverage were issued via U.S. Certified mail approximately one month prior to the upcoming selection period. Receipt of selection letters was confirmed via signature upon acceptance by the permit holder or their proxy. Once the permit holder received the selection letter, he or she was required to make contact with the observer coordinator and indicate intent to fish during the upcoming selection period. Contact was usually made by phone, and the observer coordinator gathered information concerning the vessel's name, captain, contact persons and phone numbers, communications and safety equipment available aboard the vessel, and information about the vessel's location, dates, and times of departure and return. Additional information collected included whether the vessel was active in another fishery, under repair, or no longer fishing. Upon notification of the intention to fish, the observer coordinator deployed an observer to the reported port of departure of permit holder's vessel. Because gillnet trips are generally 24 hours or less (from the time of departure from port to the time of return), the observer remained assigned to the vessel for a minimum of 3 trips to attain a sufficient level of coverage.

Observations were made as the net was hauled aboard. The observer remained on the deck of the vessel in a position with an unobstructed view and recorded species and numbers caught. When species identification was questionable, the crew stopped hauling so that the observer could examine the animal(s) for positive identification. Status (alive or dead when boated) of individuals was recorded when possible, and disposition of individuals brought

onboard was recorded as kept, discarded alive, or discarded dead. Fork lengths (cm FL) were estimated for the entire catch. When time permitted after the haulback was complete, observers directly measured a random group of 10 individuals from each species caught for fork length (FL, measured on a straight line) in cm. Sex (sharks only) was determined when possible. Biological samples (e.g. otoliths, vertebrae, reproductive organs, stomach), when taken, were removed and placed on ice after collection. Data and samples were submitted to the NMFS Southeast Fisheries Science Center (SEFSC), Panama City staff immediately upon completion of observed trips. The data were entered and proofed by SEFSC staff, examined by NMFS/SEFSC Sustainable Fisheries Division staff, and reviewed with observer contract staff to resolve any questions.

### **Results**

A total of 295 sets comprising various gillnet fisheries were observed in 2010. Set locations ranged from North Carolina to the Florida Keys in the Atlantic Ocean (Figures 1 and 2). However, location-specific reports of trips cannot be documented herein due to vessel confidentiality laws, therefore observations will be summarized by gear type. Weights for shark and teleost catch referenced herein (Tables 5 and 6) were back-calculated using estimated length (cm FL) measurements and length-weight conversions (Wigley et al. 2003; NMFS, unpublished data).

### Drift gillnet fishery

A total of 4 drift gillnet vessels were observed making 14 sets on 8 trips in 2010. Vessels targeted either bluefish or Atlantic sharpnose shark *Rhizoprionodon terraenovae*. Refinement of

the data by target species was not possible due to violation of vessel confidentiality. The distribution of observed drift gillnet fishing effort is illustrated in Figure 1. The lengths of the nets on drift net vessels for all targets ranged from 183 - 1097 m (600 - 3600 ft), with net depths of 6.1 - 15.2 m (20 - 50 ft). Stretched mesh sizes ranged from 12.1 - 13.9 cm (4.75 - 5.50 in). The average set time was 0.13 hr (0.14 S.D.), and haul time was 1.40 hr (1.64 S.D.). The total process, from the time that the net went in the water until the haul back was completed, averaged 4.07 hr (4.88 S.D.).

### Observed drift gillnet catches

Total observed catch composition for all drift sets was 58.9 % sharks, 41.0 % teleosts, and 0.04 % non-shark elasmobranchs (Table 1). Two species of sharks made up 96.6 % (by number) of the total observed shark catch: Atlantic sharpnose shark (73.5 %) and spinner shark *Carcharhinus brevipinna* (23.0 %). Composition of shark catch by weight was similar, composed of Atlantic sharpnose shark (71.1 %), followed by spinner shark (21.8 %), and scalloped hammerhead shark *Spyrna lewini* (4.6 %) (Table 5). Three species of teleosts made up approximately 97 % by number of the overall teleost catch: bluefish (65.2 %), little tunny *Euthynnus alletteratus* (6.1 %), and king mackerel (4.4 %). Catches by weight of commercially important teleosts are given in Table 6.

### Strike gillnet fishery

There were no vessels observed fishing gillnets in a strike fashion in 2010. Historically, strike netting for sharks occurs predominately in winter when the vessels target schools of blacktip sharks off the east coast of Florida (Carlson and Bethea, 2007 and references therein).

Shark-directed strike effort in 2010 was low mainly because of the reduced trip limits for LCS imposed by Amendment 2 to the Consolidated Atlantic Highly Migratory Species Fishery Management Plan (NMFS 2007), as fishers found the practice to be cost-prohibitive given the trip limits (J. Parks, NMFS, personal communication).

### Sink gillnet fishery

A total of 53 trips making 281 sink net sets on 17 vessels were observed in 2010. Trips were made targeting one or more of the following: shark, Spanish mackerel, king mackerel, Southern kingfish *Menticirrhus americanus*, Atlantic croaker *Micropogonias undulatus*, bluefish, weakfish *Cynoscion regalis* or smooth dogfish *Mustelus canis*. Refinement of the data by target species was not possible due to violation of vessel confidentiality. Observed sink gillnet fishing effort is illustrated in Figure 2.

For all targets, sink gillnet vessels fished with nets ranging 27.4 – 1097 m (90 - 3600 ft) long, net depths of 0.9 – 8.2 m (3 – 27 ft) and stretched mesh sizes 6.4 – 17.1 cm (2. 5 – 6.75 in). Set duration averaged 0.07 hr (0.13 S.D.). Hauls averaged 0.49 hr (0.59 S.D.). The entire fishing process (time net was first set until time haul back was completed) averaged 3.66 hr (6.37 S.D.). Sets were made in waters averaging 13.9 m (29.5 S.D.) deep.

### Observed sink gillnet catches

Catch composition by number of all sets for all targets was 92.6 % teleosts, 6.2 % shark, 1.1 % invertebrates and 0.1 % non-shark elasmobranchs (Table 2). One interaction with a sea bird totaled 0.002 % of the total catch. By number, shark catch was primarily spiny dogfish *Squalus acanthias* (45.9 %), smooth dogfish (28.9 %) and Atlantic sharpnose shark (15.5 %). By

weight the shark catch was similar and made up mostly of spiny dogfish (84.6 %), followed by smooth dogfish (6.2 %) and Atlantic sharpnose shark (3.5 %) (Table 5). Southern kingfish made up 27.6 % of the teleost catch by number, followed by Atlantic menhaden *Brevoortia tyrannus* (21.6 %), Atlantic butterfish *Peprilus triacanthus* (13.7 %) and Spanish mackerel (13.5 %). Catches by weight of commercially important teleosts are given in Table 6.

### Average size

The average (S.D.) lengths of sharks measured by gear type can be found in Table 3.

Average (S.D.) fork lengths of sharks caught in the drift gillnet fishery ranged from 69.1 cm

(9.5) for spinner shark, to 76.9 cm (3.7) for Atlantic sharpnose shark. Observed sink gillnet sets resulted in measurements ranging from 65.7 cm (9.1) for sandbar shark *Carcharhinus plumbeus*, to 117 cm (0.0) for common thresher shark *Alopias vulpinus*.

Average (S.D.) lengths of teleosts ( $n \ge 5$ ) measured by gear type can be found in Table 4. Average (S.D.) fork lengths of teleosts caught in the drift gillnet fishery ranged from 60.0 cm (7.5) for little tunny, to 86.8 cm (5.8) for cobia *Rachycentron canadum*. Average (S.D.) fork lengths of teleosts caught in the sink gillnet fishery ranged from 14.5 cm (2.8) for spiny puffer family *Diodontidae*, to 103.3 cm (10.0) for king mackerel.

### Protected resources interactions

One interaction with a protected resource was documented over 295 sets observed in 2010. One common loon *Gavia immer* was caught with sink gillnet gear. The bird was discarded dead.

### **Discussion**

Since the implementation of Amendment 2 to the Consolidated Atlantic Highly

Migratory Species Fishery Management Plan (NMFS 2007), there has been substantial decline in
observed gillnet trips targeting LCS from years prior. This trend persisted in 2010, as most
fishers continue to find operating costs too high given the small 33-head LCS trip limit.

Additionally, the abbreviated season for LCS in the Atlantic (July 15<sup>th</sup> - December 5<sup>th</sup>) further
restricted gillnet effort targeting these sharks. The small coastal shark fishery was also closed
between January and June 2010 pending the effective date of Amendment 3, and the quota was
filled and closed by November 2<sup>nd</sup>, 2010. This led to further reduction in the number of shark
targeted trips observed as well as a reduction in trips deploying drift and strike gillnet gear. As a
result of these declines, the southeast gillnet observer program has shifted focus to include
coverage of teleost targeted gillnet trips as well. The scope of observer coverage will continue to
change in response to the dynamics of the gillnet fishery, regardless of target. Continued
fisheries monitoring will contribute to a better understanding of the impacts on all marine
resources.

### Acknowledgments

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Table 1. Total drift gillnet catch by species and species disposition in order of decreasing abundance for all observed trips, 2010. Catch disposition is by percent kept (Kept %), percent discarded alive (D.A. %), and percent discarded dead (D.D. %).

		Total			
		Number		D.A.	D.D.
Species	Common Name	Caught	Kept (%)	(%)	(%)
Rhizoprionodon terraenovae	Atlantic sharpnose shark	2006	99.7	0.2	0.1
Pomatomus saltatrix	Bluefish	1647	100.0	0.0	0.0
Carcharhinus brevipinna	Spinner shark	628	7.8	1.6	90.6
Euthynnus alletteratus	Little tunny	115	100.0	0.0	0.0
Scomberomorus cavalla	King mackerel	83	47.0	0.0	53.0
Carcharhinus acronotus	Blacknose shark	47	100.0	0.0	0.0
Sphyrna lewini	Scalloped hammerhead shark	33	78.8	0.0	21.2
Rachycentron canadum	Cobia	28	32.1	14.3	53.6
Echeneidae	Remora family	14	0.0	100.0	0.0
Sphyrna tiburo	Bonnethead shark	10	100.0	0.0	0.0
Carcharhinus limbatus	Blacktip shark	4	100.0	0.0	0.0
Selene setapinnis	Moonfish	4	0.0	0.0	100.0
Sphyraenidae	Barracuda family	4	100.0	0.0	0.0
Istiophorus platypterus	Sailfish	2	0.0	0.0	100.0
Rhinoptera bonasus	Cownose ray	2	0.0	100.0	0.0

Table 2. Total sink gillnet catch by species and species disposition in order of decreasing abundance for all observed trips, 2010. Catch disposition is by percent kept (Kept %), percent discard alive (D.A. %), and percent discard dead (D.D. %).

		Total			
		Number	Kept	D.A.	D.D.
Species	Common Name	Caught	(%)	(%)	(%)
Menticirrhus americanus	Southern kingfish	12890	99.1	0.0	0.9
Brevoortia tyranus	Atlantic menhaden	10071	42.5	1.2	56.3
Peprilus triacanthus	Atlantic butterfish	6408	99.5	0.1	0.5
Scomberomorus maculatus	Spanish mackerel	6325	99.2	0.0	0.8
Pomatomus saltatrix	Bluefish	3486	96.1	0.5	3.4
Micropogonias undulatus	Atlantic croaker	3224	71.2	21.4	7.5
Leiostomus xanthurus	Spot	2083	68.6	1.9	29.5
Squalus acanthias	Spiny dogfish	1436	0.6	96.2	3.1
Mustelus canis	Smooth dogfish	904	7.7	90.4	1.9
Cynoscion regalis	Weakfish seatrout	583	41.2	14.1	44.8
Rhizoprionodon terraenovae	Atlantic sharpnose shark	485	13.2	65.6	21.2
Asteroidea	Sea stars	361	0.0	100.0	0.0
Chloroscombrus chrysurus	Atlantic bumper	254	55.1	18.5	26.4
Brevoortia smithi	Yellowfin menhaden	237	89.9	2.1	8.0
Sarda sarda	Bonito	214	99.5	0.5	0.0
Carcharhinus plumbeus	Sandbar shark	144	0.0	100.0	0.0
Callinectes sapidus	Blue crab	133	0.8	92.5	6.8
Larimus fasciatus	Banded drum	129	0.0	9.3	90.7
Scomberomorus cavalla	King mackerel	115	81.7	6.1	12.2
Cynoscion sp.	Seatrouts	102	19.6	35.3	45.1
Chaetodipterus faber	Spadefish	70	4.3	51.4	44.3
Rachycentron canadum	Cobia	62	17.7	51.6	30.7
Carcharhinus limbatus	Blacktip shark	60	88.3	11.7	0.0
Euthynnus alletteratus	Little tunny	59	100.0	0.0	0.0
Caranx crysos	Bluerunner jack	53	100.0	0.0	0.0
Trichiurus lepturus	Atlantic cutlassfish	53	100.0	0.0	0.0
Lepisosteidae	Gar family	39	66.7	20.5	12.8
Sphyrna tiburo	Bonnethead shark	39	10.3	18.0	71.8
Carcharhinus brevipinna	Spinner shark	35	85.7	11.4	2.9
Diodontidae	Spiny puffer family	30	0.0	100.0	0.0
Rhinoptera bonasus	Cownose ray	30	0.0	100.0	0.0
Opisthonema oglinum	Atlantic thread herring	28	0.0	53.6	46.4
Cancer borealis	Jonah crab	23	0.0	100.0	0.0
Paralichthys sp.	Flounders	23	8.7	91.3	0.0
Prionotus sp.	Searobins	21	0.0	33.3	66.7
Clupeidae	Herring family	20	15.0	0.0	85.0
Sphyrna lewini	Scalloped hammerhead shark	19	5.3	68.4	26.3
Orthopristis chrysoptera	Pigfish	17	11.8	88.2	0.0
Raja eglanteria	Clearnose skate	17	5.9	88.2	5.9

Table 2, cont.

		Total			
		Number	Kept	D.A.	D.D.
Species	Common Name	Caught	(%)	(%)	(%)
Scyphozoa	Jellyfish	17	0.0	100.0	0.0
Selene vomer	Lookdown	16	0.0	68.8	31.3
Selene setapinnis	Moonfish	12	0.0	0.0	100.0
Caranx hippos	Crevalle jack	10	100.0	0.0	0.0
Majidae	Spider crabs	9	0.0	100.0	0.0
Echinodermata	Sea urchins	8	0.0	0.0	100.0
Elops saurus	Ladyfish	8	12.5	0.0	87.5
Decapoda	Shrimp	7	100.0	0.0	0.0
Lagodon rhomboides	Pinfish	7	0.0	85.7	14.3
Trachinotus carolinus	Florida pompano	6	50.0	0.0	50.0
Dasyatis sabina	Atlantic stingray	5	0.0	100.0	0.0
Paralichthys lethostigma	Southern flounder	5	0.0	100.0	0.0
Arius felis	Hardhead catfish	4	0.0	100.0	0.0
Synodontidae	Lizardfish family	4	0.0	0.0	100.0
Archosargus probatocephalus	Sheepshead	3	100.0	0.0	0.0
Carcharhinus isodon	Finetooth shark	3	33.3	33.3	33.3
Pogonias cromis	Black drum	3	0.0	100.0	0.0
Scomber scombrus	Atlantic mackeral	3	100.0	0.0	0.0
Alopias vulpinus	Common thresher shark	2	100.0	0.0	0.0
Bagre marinus	Gafftopsail catfish	2	0.0	0.0	100.0
Mugil curema	Silver mullet	2 2	100.0	0.0	0.0
Myliobatis freminvillei	Bullnose ray	2	0.0	100.0	0.0
Aluterus monoceros	Unicorn filefish	1	0.0	100.0	0.0
Carcharhias taurus	Sand tiger shark	1	0.0	100.0	0.0
Carcharhinus acronotus	Blacknose shark	1	0.0	100.0	0.0
Carcharhinus obscurus	Dusky shark	1	0.0	100.0	0.0
Gavia immer	Common loon	1	0.0	0.0	100.0
Peprilus alepidotus	Harvestfish	1	0.0	0.0	100.0
Sphyrna zygaena	Smooth hammerhead shark	1	0.0	0.0	100.0
Trachipteridae	Dealfish family	1	100.0	0.0	0.0
Trinectes maculatus	Hogchoker	1	0.0	100.0	0.0

Table 3. Average size (fork length, FL) and standard deviation (S.D.) of sharks measured for all observed trips by gear type, 2010.

Gear Type	Species	Common Name	n	Average FL (cm)	S.D.
Drift	Rhizoprionodon terraenovae	Atlantic sharpnose shark	31	76.9	3.7
	Carcharhinus brevipinna	Spinner shark	14	69.1	9.5
Sink	Rhizoprionodon terraenovae	Atlantic sharpnose shark	78	74.7	11.1
	Mustelus canis	Smooth dogfish	77	66.2	19.9
	Carcharhinus plumbeus	Sandbar shark	25	65.7	9.1
	Sphyrna lewini	Scalloped hammerhead shark	12	87.0	11.6
	Squalus acanthias	Spiny dogfish	11	79.0	7.7
	Carcharhinus limbatus	Blacktip shark	10	107.8	22.6
	Carcharhinus brevipinna	Spinner shark	4	82.3	22.8
	Sphyrna tiburo	Bonnethead shark	3	78.3	29.9
	Carcharhinus isodon	Finetooth shark	2	81.0	45.3
	Alopias vulpinus	Common thresher shark	1	117.0	0.0
	Carcharhinus obscurus	Dusky shark	1	105.0	0.0
	Sphyrna zygaena	Smooth hammerhead shark	1	75.0	0.0

Table 4. Average size (fork length, FL) and standard deviation (S.D.) of non-sharks measured for all observed trips by gear type, 2010, where sample size  $\geq$  5.

Gear Type	Species	Common Name	n	Average FL (cm)	S.D.
Drift	Pomatomus saltatrix	Bluefish	76	72.5	4.6
	Scomberomorus cavalla	King mackerel	12	83.5	7.8
	Euthynnus alletteratus	Little tunny	10	60.0	7.5
	Rachycentron canadum	Cobia	5	86.8	5.8
Sink	Scomberomorus maculatus	Spanish mackerel	908	47.0	5.6
	Menticirrhus americanus	Southern kingfish	468	30.3	2.7
	Pomatomus saltatrix	Bluefish	436	40.8	7.1
	Peprilus triacanthus	Atlantic butterfish	330	18.2	2.2
	Brevoortia tyranus	Atlantic menhaden	216	23.0	7.5
	Sarda sarda	Bonito	134	56.2	4.6
	Micropogonias undulatus	Atlantic croaker	120	27.6	2.9
	Cynoscion regalis	Weakfish seatrout	87	33.6	2.7
	Scomberomorus cavalla	King mackerel	79	103.3	10.0
	Euthynnus alletteratus	Little tunny	31	59.0	5.1
	Leiostomus xanthurus	Spot	27	22.3	1.5
	Rachycentron canadum	Cobia	26	87.1	11.7
	Brevoortia smithi	Yellowfin menhaden	21	26.5	2.0
	Chloroscombrus chrysurus	Atlantic bumper	17	16.2	1.2
	Cynoscion sp.	Seatrouts	16	28.9	3.0
	Chaetodipterus faber	Spadefish	11	17.7	1.6
	Lepisosteidae	Gar family	11	95.1	4.8
	Caranx crysos	Bluerunner jack	10	25.5	1.8
	Caranx hippos	Crevalle jack	8	17.9	1.5
	Diodontidae	Spiny puffer family	8	14.5	2.8

Table 5. Estimated shark catch by weight (kg), back-calculated from estimated lengths of all sharks observed caught in gillnet gear, 2010.

Gear				
Type	Species	<b>Common Name</b>	Catch (kg)	% Total Sharks
Drift	Rhizoprionodon terraenovae	Atlantic sharpnose shark	5687.00	71.1
	Carcharhinus brevipinna	Spinner shark	1739.27	21.8
	Sphyrna lewini	Scalloped hammerhead shark	370.92	4.6
	Carcharhinus acronotus	Blacknose shark	154.66	1.9
	Carcharhinus limbatus	Blacktip shark	23.41	0.3
	Sphyrna tiburo	Bonnethead shark	22.11	0.2
	Total – Drift Gear		7997.37	
Sink	Squalus acanthias	Spiny dogfish	26139.3	84.6
	Mustelus canis	Smooth dogfish	1927.7	6.2
	Rhizoprionodon terraenovae	Atlantic sharpnose shark	1068.9	3.5
	Carcharhinus limbatus	Blacktip shark	562.3	1.8
	Carcharhinus brevipinna	Spinner shark	472.0	1.5
	Carcharhinus plumbeus	Sandbar shark	465.3	1.5
	Sphyrna lewini	Scalloped hammerhead shark	113.3	0.4
	Sphyrna tiburo	Bonnethead shark	57.8	0.2
	Alopias vulpinus	Common thresher shark	46.4	0.2
	Carcharhinus obscurus	Dusky shark	13.9	0.0
	Carcharhinus acronotus	Blacknose shark	7.8	0.0
	Carcharhinus isodon	Finetooth shark	6.4	0.0
	Sphyrna zygaena	Smooth hammerhead shark	4.4	0.0
	Carcharhias taurus	Sand tiger shark	3.8	0.0
	Total – Sink Gear		30889.1	

Table 6. Estimated catch by weight (kg) of commercially important teleosts, back-calculated from estimated lengths of all individuals observed caught in gillnet gear, 2010.

Gear Type	Species	Common Name	Catch (kg)
Drift	Pomatomus saltatrix	Bluefish	9567.9
	Euthynnus alletteratus	Little tunny	596.0
	Scomberomorus cavalla	King mackerel	428.1
Sink	Menticirrhus americanus	Southern kingfish	9491.2
	Scomberomorus maculatus	Spanish mackerel	6025.7
	Pomatomus saltatrix	Bluefish	4195.3
	Brevoortia tyranus	Atlantic menhaden	1472.9
	Scomberomorus cavalla	King mackerel	1370.0
	Peprilus triacanthus	Atlantic butterfish	427.7
	Micropogonias undulatus	Atlantic croaker	147.9

Figure 1. Distribution of observed drift gillnets sets, 2010.

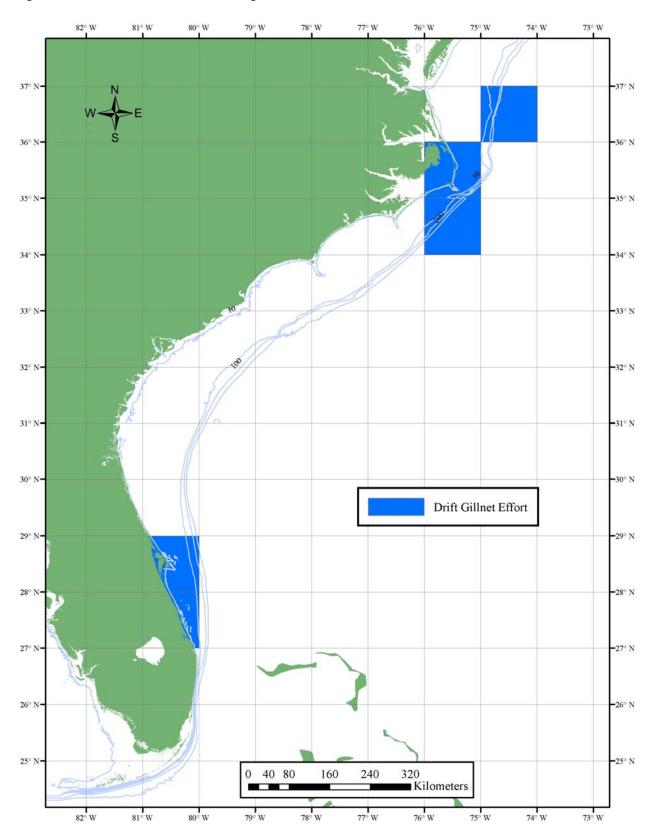


Figure 2. Distribution of observed sink gillnets sets, 2010.

